

What is claimed is:

1. A voice coil actuator comprising
a core having an axis;
a permanent magnet having a longitudinal axis, and positioned
5 so that the longitudinal axis of the permanent magnet is substantially parallel to the axis of the core;
a moving coil positioned to interact with the permanent magnet along the axis of the core; and
a compensating coil positioned to interact with the moving coil,
10 wherein a magneto-motive force in the compensating coil is controlled as a function of a position of the moving coil.
2. An actuator comprising
a core;
a permanent magnet having a longitudinal axis, and positioned
15 so that the longitudinal axis of the permanent magnet is substantially parallel to an axis of the core;
a moving coil positioned to interact with the permanent magnet along the axis of the core; and
a compensating coil positioned to interact with the moving coil
20 and having a magneto-motive force which is controlled as a function of a position of the moving coil.
3. The actuator of claims 1 or 2, wherein the compensating coil is positioned about the core.
4. The actuator of claim 3, wherein the compensating coil
25 extends along substantially the entire length of the core.
5. The actuator of claims 1 or 2 wherein the permanent magnet is positioned with respect to the core to define a cavity between the core and an end of the permanent magnet; and further wherein the compensating coil is positioned in the cavity.
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6. The actuator of claim 5, wherein the compensating coil fills the cavity.

7. The actuator of claim 5, wherein a second cavity is defined at another end of the permanent magnet between the permanent magnet and the core, and further wherein a further compensating coil is positioned in the second cavity.
- 5 8. The actuator of claim 4, wherein the permanent magnet is positioned with respect to the core to define a cavity between the core and an end of the permanent magnet; and further wherein a second compensating coil is positioned in the cavity.
- 10 9. The actuator of claim 8, wherein a second cavity is defined at another end of the permanent magnet between the permanent magnet and the core, and further wherein a further compensating coil is positioned in the second cavity.
- 15 10. The actuator of claim 7, further including a core compensating coil positioned about the core.
11. The actuator of claims 1 or 2, further including
a position sensor responsive to the position of the moving coil; and
a power supply responsive to the position sensor and coupled to the compensating coil.
- 20 12. An actuator comprising:
a field blank which forms a housing;
a core;
a permanent magnet having a longitudinal axis, positioned in the housing and so that the longitudinal axis of the permanent magnet is substantially parallel to an axis of the core;
a moving coil positioned to interact with the permanent magnet along the axis of the core; and
a plurality of compensating coils positioned to interact with the moving coil and controlled as a function of a position of the moving coil, including
a core compensating coil positioned about the core;
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a first compensating coil positioned in a cavity formed between an end of the permanent magnet and the housing.

13. The actuator of claim 12, further including a second compensating coil positioned in a second cavity formed between an other end of the permanent magnet and the housing.
14. The actuator of claim 13, further including a position sensor responsive to the position of the moving coil; and
- 10 a plurality of power supplies, each responsive to the position sensor, and coupled to provide power to a corresponding one of the core compensating coil, the first compensating coil, and the second compensating coil, as a function of the stroke of the moving coil.
15. The actuator of claim 4, wherein the actuator is closed-ended.
16. The actuator of claim 4, wherein the actuator is open-ended.
17. The actuator of claim 10, wherein the actuator is closed-ended.
- 20 18. The actuator of claim 10, wherein the actuator is open-ended.
19. The actuator of claim 14, wherein the actuator is closed-ended.
20. The actuator of claim 14, wherein the actuator is open-ended.
- 25 21. The actuator of claims 1 or 2, wherein the actuator has a rectangular cross section.
22. The actuator of claims 1 or 2, wherein the actuator has a cylindrical shape.
- 30 23. A voice coil actuator comprising :
a field blank which forms a housing;

- a core;
- a permanent magnet having a longitudinal axis, and positioned so that the longitudinal axis of the permanent magnet is substantially parallel to an axis of the core;
- 5 a coil positioned about the core to be moveable along and to interact with the permanent magnet along the axis of the core, wherein magnetic flux is produced in an air gap between the moveable coil and the permanent magnet;
- 10 a compensating coil positioned to interact with the moveable coil; and
- a power supply coupled to the compensating coil so that magneto-motive force is produced in the compensating coil of a magnitude which is a function of positions of the moveable coil along the core to alter the magnetic flux in the air gap.
- 15 **24.** The voice coil actuator of claim 23, wherein the compensating coil is positioned about the core.
25. The voice coil actuator of claim 23, in which the core, the permanent magnet, the moving coil and the compensating coil are positioned in the housing formed by the field blank, and wherein the
20 compensating coil is further positioned at an end of the permanent magnet along the longitudinal axis of the permanent magnet and in a cavity between the permanent magnet and the field blank.
26. The voice coil actuator of claim 25, wherein the voice coil actuator has a rectangular cross section.

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